



United States Department of the Interior

U. S. GEOLOGICAL SURVEY

Columbia Environmental Research Center
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Columbia, Missouri 65201

Date: July 6, 2012

To: Burt Shephard (USEPA Region 10) and Teresa Norberg-King (USEPA Duluth)

From: Chris Ingersoll

Subject: USGS Columbia Environmental Research Center (USGS-Columbia) quarterly summary for the project entitled: "Freshwater Mussel Toxicity Testing: Expansion of Freshwater Mussel Water and Sediment Toxicity Testing Methods"

cc: Ning Wang, Nile Kemble, John Besser, Chris Ivey, Ryan Warbritton, Bill Brumbaugh, David Alvarez, Carl Orazio, Rip Shively (USGS-Columbia), Chris Barnhart (Missouri State University), Joe Bartoszek (USFWS), Ed Hammer and Candice Bauer (USEPA Chicago), Sandy Raimondo (USEPA Gulf Breeze), Tom Augspurger (USFWS Raleigh), Jeannette Howard (The Nature Conservancy)

Attached please find the 04/01/12 to 06/30/12 quarterly summary for the USGS-Columbia project entitled: "Freshwater Mussel Toxicity Testing: Expansion of Freshwater Mussel Water and Sediment Toxicity Testing Methods." Please contact us if you have any questions concerning the attached summary (cingersoll@usgs.gov, nwang@usgs.gov).

COLUMBIA ENVIRONMENTAL RESEARCH CENTER
UNITED STATES GEOLOGICAL SURVEY, COLUMBIA, MO
QUARTERLY PROGRESS SUMMARY

USGS Basis+ Project SB00E9H (Task 6); Program Element 31070

USGS Project Managers: Chris Ingersoll, Ning Wang

Title: Freshwater Mussel Toxicity Testing: Expansion of Freshwater Mussel Water and Sediment Toxicity Testing Methods

The objective of this study is to develop methods for collecting, culturing and conducting laboratory water or sediment toxicity tests with freshwater mussels native to the western United States, primarily but not necessarily limited to species within the family Margaritiferidae. Testing of mussels will require collection of adults, establishing laboratory cultures, and evaluating methods for conducting toxicity tests (e.g., test conditions, test acceptability requirements). See the USEPA-USGS interagency agreement for additional detail (dated June 6, 2012) and USGS Quality Assurance Project Plan (draft dated July 6, 2012).

1. What work was accomplished for this past quarter (04/01/12 to 06/30/12)?
 - A. Participated on periodic conference calls with USEPA and with USFWS to discuss the design and status of the project.
 - B. Received funding for the project June 6, 2012.
 - C. Developed a draft QAPP (sent with this quarterly report). Note that this draft QAPP has not yet been reviewed by principal investigators.
 - D. Collected female western pearlshell (*Margaritifera falcata*) containing mature glochidia and transported these adult female mussels to Missouri State University of propagation of juvenile mussels.
 - E. Transformed glochidia to newly released juveniles using rainbow trout as the fish host
 - F. Developed a study outline describing the methods for conducting 4-day water-only acute toxicity tests with these newly release juvenile mussels. Information in this study outline will serve as the basis for developing the Quality Assurance Project Plan for the project during the next quarter.
 - G. Conducted 4-d acute toxicity tests with newly transformed *M. falcata* these juveniles with the following chemicals (USGS Study Code 12-20-03). Concentration(s) close to historic acute EC50 for mussels on near USPA WQC are indicated in bold:
 1. Copper (CuSO₄): 0, **6.25**, **12.5**, 25, 50, and 100 µg Cu/L
 2. Ammonia (NH₄CL₂): 0, 1, 2, **4**, 8, and 16 mg N/L
 3. Nickel (NiCl₂): 0, 100, 200, **400**, 800, and 1600 µg Ni/L
 4. Potassium chloride (KCl): 0, 12.5, 25, **50**, 100, and 200 mg KCL/L
 5. Zinc (ZnCl₂): 0, 50, 100, **200**, **400**, and 800 µg Zn/L
 6. Chloride (NaCl): 0, 1, **2**, **4**, 8, and 16 g NaCl/L
 7. Sulfate (NaSO₄): 0, 400, 800, **1,600**, 3200, and 6400 mg SO₄/L
 8. Malathion: 0, 3,125, 6,250, 12,500, **25,000**, and **50,000** µg/L)

9. Metolachlor: 0, 4, 8, **16, 32**, and 64 mg/L (study not yet completed)
10. Chromium VI (CrO₃): 0, 125, 250, **500, 1,000**, and 2,000 µg Cr/L)
- H. Conducted 4-d acute toxicity tests with fatmucket (*Lampsilis siliquioidea*) with the following chemicals: nickel, potassium chloride, sodium chloride, sulfate, chromium, malathion, and metolachlor.
- I. Started a study to determine how well the newly transformed *M. falcata* juvenile mussels could be held under culture conditions in the laboratory at MSU. Good survival and growth was observed after 4 weeks with juvenile mussels held in fine-grained sediment under static renewal conditions (replacing water and sediment weekly). However, survival of juvenile *M. falcata* in recirculating 5-gallon buckets was poor after 4 weeks.
- J. Depending on the outcome of the culturing of the juvenile *M. falcata*, USGS will evaluate methods for conducting chronic 28-d water-only or whole-sediment toxicity tests (with juvenile *M. falcata* at a size of about 1 to 2 mm shell length). It is anticipated that it may take up to two months to culture these juvenile mussels to this size.
2. What problems (or sources of error) were encountered, if any?
- None
3. If a problem was encountered, what action was taken to correct it?
- None
4. What work is projected for the new quarterly activity?
- A. Finalize QAPP.
- B. Summarize water and chemistry data for the acute toxicity tests conducted to date.
- C. Continue evaluation of methods to culture juvenile *M. falcata* to a size for use in water or sediment toxicity tests.
- D. Depending on the outcome of the culturing of the juvenile *M. falcata*, conduct a study to evaluate methods for conducting 28-d water or sediment toxicity tests (using control water or control sediments).
5. Is the project work on schedule?
- For the quarter? Yes
- For the project? Yes
6. Does the project funding rate support the work progress?
- Yes
7. What has been spent to date?
- If requested, USGS will provide USEPA summaries of expenditures on the project.

8. Have you submitted a quarterly voucher for reimbursement?

Will be done on a quarterly basis

9. Is there a change in principal investigator?

No

10. If you have a multi-year project with budget periods, have you submitted your request for a funding amendment?

Not applicable